10 CFR 50.73

Progress Energy

Serial: RNP-RA/07-0067

JUL 11 2007

Attn: Document Control Desk
United States Nuclear Regulatory Commission
Washington, DC 20555-0001

H. B. ROBINSON STEAM ELECTRIC PLANT, UNIT NO. 2
DOCKET NO. 50-261/LICENSE NO. DPR-23

LICENSEE EVENT REPORT NO. 2007-001-00
REACTOR TRIP DUE TO A LOOSE WIRE IN THE
MAIN TRANSFORMER MONITORING CIRCUITRY

Ladies and Gentlemen:

The attached Licensee Event Report is submitted in accordance with the requirements of 10 CFR 50.73. Should you have any questions regarding this matter, please contact Mr. C. T. Baucom at (843) 857-1253.

Sincerely,

Ernest J. Kapopoulos, Jr.
Plant General Manager
H. B. Robinson Steam Electric Plant, Unit No. 2

CTB/cac

Attachment

c: Dr. W. D. Travers, NRC, Region II
L. M. Regner, NRC, NRR
NRC Resident Inspector, HBRSEP

Progress Energy Carolinas, Inc.
Robinson Nuclear Plant
3581 West Entrance Road
Hartsville, SC 29550

IE22

NRR

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NRC FORM 366 (6-2004) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB NO. 3150-0104 EXPIRES 6-30-2007

Estimated burden per response to comply with this mandatory collection request: 50 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the Records and FOIA/Privacy Service Branch (T-5 F52), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to infocollects@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202 (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

LICENSEE EVENT REPORT (LER)

(See reverse for required number of digits/characters for each block)

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4. TITLE

Reactor Trip Due to a Loose Wire in the Main Transformer Monitoring Circuitry

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
										05000
05	15	2007	2007	- 001 -	00	07	11	2007	FACILITY NAME	DOCKET NUMBER
										05000

9. OPERATING MODE

1

10. POWER LEVEL

84%

11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply)

☐ 20.2201(b)	☐ 20.2203(a)(3)(i)	☐ 50.73(a)(2)(i)(C)	☐ 50.73(a)(2)(vii)
☐ 20.2201(d)	☐ 20.2203(a)(3)(ii)	☐ 50.73(a)(2)(ii)(A)	☐ 50.73(a)(2)(viii)(A)
☐ 20.2203(a)(1)	☐ 20.2203(a)(4)	☐ 50.73(a)(2)(ii)(B)	☐ 50.73(a)(2)(viii)(B)
☐ 20.2203(a)(2)(i)	☐ 50.36(c)(1)(i)(A)	☐ 50.73(a)(2)(iii)	☐ 50.73(a)(2)(ix)(A)
☐ 20.2203(a)(2)(ii)	☐ 50.36(c)(1)(ii)(A)	☒ 50.73(a)(2)(iv)(A)	☐ 50.73(a)(2)(x)
☐ 20.2203(a)(2)(iii)	☐ 50.36(c)(2)	☐ 50.73(a)(2)(v)(A)	☐ 73.71(a)(4)
☐ 20.2203(a)(2)(iv)	☐ 50.46(a)(3)(ii)	☐ 50.73(a)(2)(v)(B)	☐ 73.71(a)(5)
☐ 20.2203(a)(2)(v)	☐ 50.73(a)(2)(i)(A)	☐ 50.73(a)(2)(v)(C)	☐ OTHER Specify in Abstract below or in NRC Form 366A
☐ 20.2203(a)(2)(vi)	☐ 50.73(a)(2)(i)(B)	☐ 50.73(a)(2)(v)(D)	

12. LICENSEE CONTACT FOR THIS LER

FACILITY NAME	TELEPHONE NUMBER (Include Area Code)
C. T. Baucom	843-857-1253

13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT

CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX
B	BA	HS	GEMCO	Y					

14. SUPPLEMENTAL REPORT EXPECTED

☐ YES (If yes, complete 15. EXPECTED SUBMISSION DATE). ☒ NO

15. EXPECTED SUBMISSION DATE	MONTH	DAY	YEAR

ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)

At 1116 hours EDT on May 15, 2007, with H. B. Robinson Steam Electric Plant (HBRSEP), Unit No. 2, in Mode 1 at approximately 84% power, a generator lockout signal tripped the main turbine-generator [TG:TA,TB], which resulted in a reactor trip. The generator lockout signal was caused by an electrical fault in the circuitry for the "C" phase main transformer [XFMR:EL] alarm panel. The root cause of this event was the failure to crimp and inspect the tightness of the lug connecting the current transformer (CT) to the transformer alarm panel, which allowed the wire to disconnect and cause an AC electrical voltage from the "C" main transformer neutral bushing CT to be superimposed on the Train "A" DC system. The Train "A" motor-driven auxiliary feedwater (MDAFW) pump [P:BA] failed to start automatically, but it was started manually within about one minute after the reactor trip by an operator. The cause of the Train "A" MDAFW pump failure was subsequently determined to be a failure of the control switch [HS:BA], which prevented the automatic start signal. The equipment was repaired and the unit was placed back on-line at about 1211 hours on May 17, 2007. Planned corrective actions include procedure changes to verify proper connections in the main transformer equipment during work on that equipment and replacement of the Train "B" MDAFW pump control switch during the next refueling outage. The condition described in this Licensee Event Report is reportable in accordance with 10 CFR 50.73(a)(2)(iv)(A), any event or condition that resulted in manual or automatic actuation of any of the systems listed in 10 CFR 50.73(a)(2)(iv)(B).

LICENSEE EVENT REPORT (LER)

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NARRATIVE

I. DESCRIPTION OF EVENT

At 1116 hours EDT on May 15, 2007, with H. B. Robinson Steam Electric Plant (HBRSEP), Unit No. 2, in Mode 1 at approximately 84% power, a generator lockout signal tripped the main turbine-generator [TG:TA,TB], which resulted in a reactor trip. The generator lockout signal was caused by an electrical fault in the circuitry for the "C" phase main transformer [XFMR:EL] alarm panel.

The electrical fault was determined to be a loose connection, which allowed a wire associated with the 230 Kilovolt (KV) neutral bushing current transformer (CT) [XCT:EL] to become disconnected from the terminal. It was also determined that the disconnected CT wire had evidence of arcing that resulted in overheating. The overheating damaged insulation on nearby wiring, including a direct current (DC) power source to the alarm panel from the Train "A" DC system [EI]. The insulation damage allowed an alternating current (AC) voltage source from the CT to be superimposed on the Train "A" DC system.

The AC voltage superimposed on the Train "A" DC system caused spurious alarms and indications, and directly affected the main generator protective relay 87G [87:EL], which eventually caused the turbine trip that in turn caused the reactor trip. The initial spurious alarms and indications occurred at approximately 1028 hours. The operations crew on-duty immediately began efforts to determine the cause of the unexpected alarms and indications. The unexpected indications included: 24 different alarms; both source range detectors [DET:IG] had count indications (although the source range detectors are expected to be deenergized during power operation); the Train "A" DC battery bus voltage indicated zero volts on the plant computer system; the supply breaker [72:EI] for the "C" inverter was tripped; output voltage from the rod drive motor-generator sets [MG:AA] was cycling from about 250 volts to about 310 volts; and, the indication for the breaker from the start-up transformer to 4 kilovolt bus number 2 (breaker 52/12) [52:EA] showed both the open and closed indications as lit (dual indication). Also prior to the trip, a loud humming noise was heard emitting from the main generator protection panel.

The operators attempted to correct the dual indication on breaker 52/12 by removing and reinstalling the control power fuses [FU:EA]. During the time that the control power fuses were removed, the applicable Technical Specifications (TS) Limiting Condition for Operation (LCO) Section 3.8.1, Condition A, was entered.

After the reactor trip at 1116 hours, the plant systems responded as expected including breaker 52/12 which properly actuated to maintain offsite power to the associated buses. The noted exception in expected response was the Train "A" motor-driven auxiliary feedwater (MDAFW) pump [P:BA] failed to start automatically. The Train "A" MDAFW pump was started manually within about one minute after the reactor trip by an operator. The cause of the Train "A" MDAFW pump failure was subsequently determined to be a failure of the control switch [HS:BA], which prevented the automatic start signal.

After the unit trip, the "C" main transformer was automatically deenergized. This discontinued the superimposition of the AC voltage on the Train "A" DC system. The investigation of the

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NARRATIVE

cause of the trip discovered the loose wire and circuit path that had been created. The loose wire was corrected, the control switch for the Train "A" MDAFW pump was replaced, and testing was conducted to verify the proper operation of the Train "A" reactor protection system [JD] and safeguards relay rack [JE]. The unit was placed back on-line May 17, 2007, at approximately 1211 hours.

II. CAUSE OF EVENT

Investigation of this event was conducted using the Corrective Action Program and documented in Significant Nuclear Condition Report (NCR) 233172. This investigation found that the root cause of this event was the failure to crimp and inspect the tightness of the lug connecting the CT to the transformer alarm panel, which allowed the wire to disconnect and cause an AC electrical voltage from the "C" main transformer neutral bushing CT to be superimposed on the Train "A" DC system. The failure to crimp this lugged connection was identified to have occurred approximately 16 years ago. The wire may have been disturbed during work performed as part of the refueling outage that was recently completed on May 13, 2007.

III. ANALYSIS OF EVENT

The condition described in this Licensee Event Report is reportable in accordance with 10 CFR 50.73(a)(2)(iv)(A), any event or condition that resulted in manual or automatic actuation of any of the systems listed in 10 CFR 50.73(a)(2)(iv)(B). Event Notification Report 43364 provided NRC notification of the required 4 and 8-hour reports on May 15, 2007. That report noted that reactor power was approximately 82%. Additional data analysis indicates that reactor power was approximately 84% at the time of trip.

The health and safety of the public and plant personnel were not impacted by this event. The required safety functions were maintained and the operating parameters of the plant remained within required safety limits. The failure of the Train "A" MDAFW pump to automatically start did not result in any adverse consequences because the operators rapidly started the pump and the other two AFW pumps automatically started and provided AFW flow.

IV. CORRECTIVE ACTIONS

Completed Corrective Actions:

- The wiring malfunction in the "C" main transformer alarm panel was repaired.
- The failed Train "A" MDAFW pump control switch was replaced.
- Testing was conducted to verify the proper operation of the Train "A" reactor protection system and safeguards relay rack equipment.

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Planned Corrective Actions:

- Procedures (CON-TRMC-00540 and CON-TRMC-00504) will be revised by September 14, 2007, to include tightness check of crimped connections including a pull test.
- The control switch for the Train "B" MDAFW pump will be replaced during the next refueling outage, which is expected to be completed by November 2, 2008.

V. ADDITIONAL INFORMATION

Failed Component Information:

The failed Train "A" MDAFW pump switch is a GEMCO Switch Model No. 404S-3-2-1-2-2-Y-AA3-AA3. The cause of the switch failure has been determined to be age-related degradation and cyclic fatigue.

Previous Similar Events:

Licensee Event Reports (LER) for HBRSEP, Unit No. 2, from approximately the past 20 years have been reviewed. The following events were found that had some similarity to the events described in this report:

- LER 96-004-00, Manual Initiation of Reactor Protection System due to Turbine Governor Valve Failure. The cause of this event was a broken wire due to wire fatigue. The corrective actions included inspection of the electro-hydraulic controller housings for the governor valves to eliminate loose and broken bolts and to eliminate sources of wire fatigue. The corrective actions for this event would not have been expected to resolve the condition described in LER 2007-001-00.
- LER 94-023-00, Condition Prohibited by the TS due to Degraded Reactor Trip Instrumentation. This event was caused by a loose electrical connection in the Train "A" DC distribution panel. The corrective actions pertained specifically to DC panel wiring connections. Therefore, the corrective actions for this event would not have been expected to resolve the condition described in LER 2007-001-00.
- LER 88-010-00, Automatic Reactor Trip due to Turbine Trip on Governor Valves Closure. The cause of this event was attributed to two defects, one of which included a loose connection. The corrective actions for this event pertained specifically to the electro-hydraulic control system. Therefore, the corrective actions for this event would not have been expected to resolve the condition described in LER 2007-001-00.

Additionally, Licensee Event Report 2003-02-00 describes an event in which a control switch failure resulted in the inoperability of a safety function. There were no specific corrective actions identified in that Licensee Event Report that would have been expected to prevent the switch failure for the Train "A" MDAFW pump.